

External drainage of large bullae in severe generalized emphysema

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The role of surgery in the treatment of generalized emphysema is limited and is of advantage only when large bullae compress adjacent functioning lung tissue. In most patients such bullae can be excised or pliated at thoracotomy with relative safety. However, in the occasional patient who is desperately ill with severe generalized pulmonary emphysema and in whom open thoracotomy is definitely contraindicated, external drainage of large unilocular bullae can produce dramatic relief with minimal risk. This technique stems from an earlier period of thoracic surgery and should not be discarded.^{1, 2}

Technique

The technique of open drainage employed is the same as that used in a two-stage cavernostomy. Under local anesthesia, a vertical incision is made over the site chosen for drainage and segments of one or two ribs are resected. The intercostal muscles and periosteum are dissected carefully off the underlying parietal pleura. Formation of a pleural symphysis is imperative in order to prevent a pneumothorax when open drainage is instituted. To produce this symphysis, the wound is packed with dry

gauze. Within 7 to 10 days following the first stage of the procedure, the bulla with the overlying pleura is incised with a cautery. The patient may experience considerable improvement in his dyspnea immediately due to egress of air. A large rubber drainage tube is placed in the bulla and fixed to the chest wall. The wound is closed about the drainage tube, an airtight dressing is applied, and the drainage tube is connected to a water-seal bottle for several days to facilitate decompression. Subsequently, open drainage is established. The presence of an open wound and a bronchopleural fistula guarantee the presence of bacterial contamination. This is accepted for it encourages the inflammatory reaction essential for obliteration of the bulla and fistula. Closure of the bronchocutaneous fistula usually requires several months.

Our experience with the use of this procedure on three occasions in 2 patients with severe generalized emphysema will now be presented. It should be emphasized that these patients were in desperate circumstances when external drainage was performed and could not have been considered candidates for open thoracotomy.

Case reports

CASE 1. L. D., a white man, had onset of dyspnea on exertion in 1949 when he was 42 years of age. This rapidly increased in severity and by 1955 he was severely dyspneic at rest, could walk only 25 steps on the level, and was

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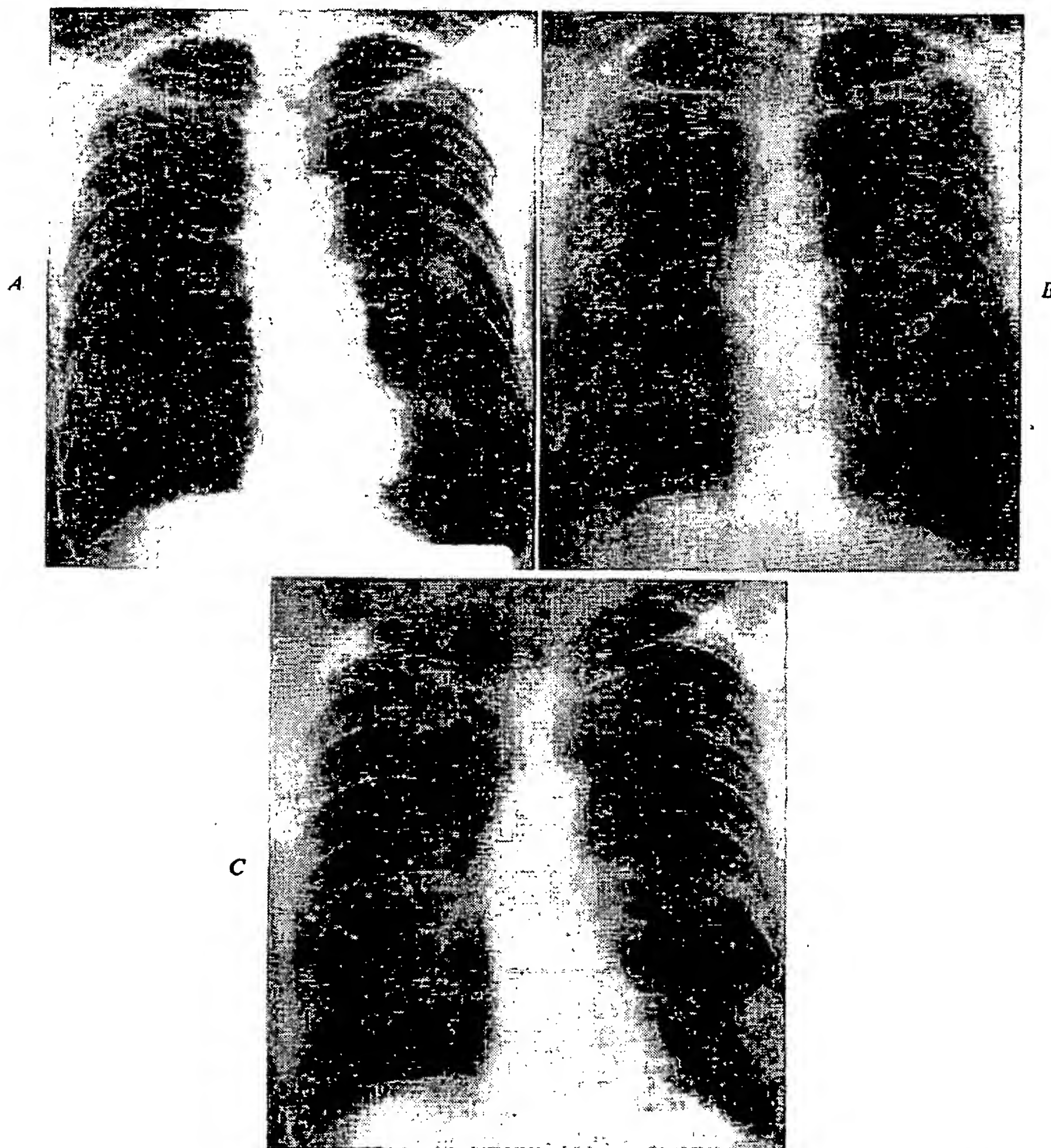


Fig. 1. *A*, A giant bulla in the right lower lobe is seen compressing adjacent lung tissue. *B*, Five years following external drainage, the compression is greatly reduced on the right side but a bulla at the base of the left lung has enlarged. *C*, Following a drainage procedure on the left side, the bulla is obliterated and the adjacent left lung has expanded. Residual pleural thickening is present.

unable to care for himself. X-ray study revealed diffuse emphysema with multiple bullae. A giant bulla arising in the right lower lobe and occupying one half of the hemithorax compressed the adjacent lung (Fig. 1, *A*). The patient's maximum breathing capacity was 35 L. per minute (30 per cent of predicted); vital capacity was 3,426 c.c. (100 per cent of predicted); 3-second vital capacity was 52 per cent of the total vital

capacity; oxygen saturation was 86 per cent at rest; P_{aCO_2} was 45 mm. Hg.

A two-stage external drainage of the bullae in the right lower lobe was done. There was a rapid diminution in the size of the bulla and the patient experienced significant symptomatic improvement. Six months postoperatively he was able to walk one half a mile on the level and could climb a flight of steps. The maximum breathing capacity

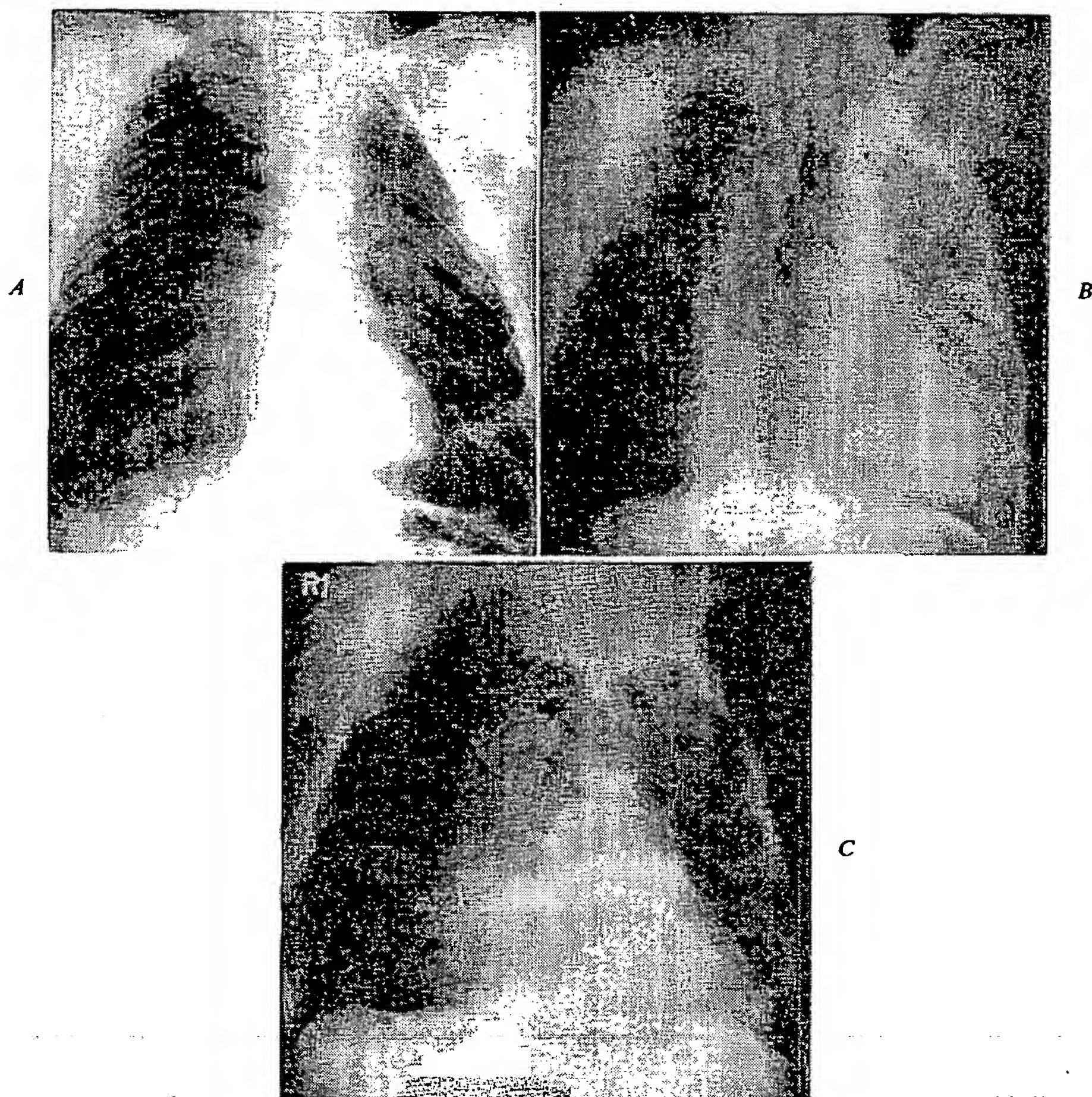


Fig. 2. *A*, Posteroanterior chest x-ray film shows diffuse emphysema bilaterally. *B*, Oblique x-ray film demonstrates large bulla in the posterior portion of the right lower lobe. *C*, X-ray film made after 2-stage external drainage of bulla shows expansion of previously compressed lung.

was 54 L. per minute (40 per cent of predicted); oxygen saturation was 92 per cent at rest.

During the next 4 years the patient remained comfortable. In 1960, however, he noticed increasing dyspnea and was hospitalized. X-ray films showed considerable enlargement of a bulla previously noted in the left lower lung field (Fig. 1, *B*). It occupied one third of the hemithorax and compression of adjacent lung was evident. His maximum breathing capacity was 37 L. per minute (30 per cent of predicted). A two-stage drainage of the bulla was performed. The patient noted moderate symptomatic improvement; obliteration

of the bulla and expansion of the previously compressed lung was seen on x-ray film (Fig. 1, *C*). The patient's condition gradually deteriorated during the 5 years following this procedure and he died in 1965. Despite the relentless progression of generalized emphysema this patient obtained considerable palliation from drainage of bilateral bullae over a period of 10 years.

CASE 2. H. B., a white man, noted the gradual onset of dyspnea on exertion and occasional wheezing in 1953 when he was 42 years of age. By 1958, these symptoms had progressed to dyspnea on walking one half a block, persistent wheezing,

and chronic productive cough. Chest x-ray films revealed evidence of diffuse emphysema with bullae occupying the upper half of both lung fields and the base of the right lung. The patient's maximum breathing capacity was 71 L. per minute (55 per cent of predicted); vital capacity was 4,250 c.c. (111 per cent of predicted); the 3-second vital capacity was 52 per cent of the total vital capacity. At left thoracotomy, the upper lobe contained several large bullae, the largest measuring 12 cm. in diameter; the lower lobe contained many small superficial bullae and one larger bulla involving the superior segment. The anterior and apical-posterior segments of the left upper lobe and the bulla in the superior segment were excised and the lung surface was sutured. The pathologic report described typical generalized emphysema with marked bullous formation. One month postoperatively because of persistent apical hydropneumothorax, a 4-rib thoracoplasty was performed. There was minimal symptomatic improvement and pulmonary function studies showed no appreciable change at 6 months and 1 year postoperatively.

Five years later, in 1963, the patient was again hospitalized because of severe respiratory distress and early right heart failure. He was totally incapacitated, living a bed and wheelchair existence; he required assistance for eating and used oxygen intermittently. X-ray films, when compared with the previous films, revealed an enlarging bulla in the right posterior basal lung field occupying approximately one half of the hemithorax with evidence of compression of adjacent lung tissue (Fig. 2, *A* and *B*). The patient's maximum breathing capacity was 27 L. per minute (19 per cent of predicted; vital capacity was 2,870 (69 per cent of predicted); P_{aCO_2} was 46 mm. Hg; arterial oxygen saturation was 90 per cent at rest.

His subjective improvement was more striking than the objective. He has had no further hospital admissions in the last 4 years although he quite naturally complains of some shortness of breath.

Discussion

A patient with severe generalized pulmonary emphysema who is further disabled by a large unilocular bulla which compresses lung tissue may be offered palliation by external drainage. Open thoracotomy with

pulmonary resection and/or unroofing and plication of bullae also offer palliation but are sufficiently hazardous as to be contraindicated in certain desperately ill patients. Neither the conservative nor the more aggressive surgical approach can alter the basic disease process and its inexorable progression. The degree of palliation attainable must be weighed against the possible morbidity and mortality.

Although guided by objective studies, the decision to use external drainage depends primarily upon the clinical interpretation of the degree of cardiopulmonary impairment present. The patient exhibiting severe generalized emphysema associated with a very low respiratory reserve, hypercapnia, hypoxia, and signs of right heart failure, and, in addition, demonstrates a unilocular bulla (usually occupying one quarter or more of a hemithorax and compressing adjacent lung) is a possible candidate for an external drainage procedure. In this type of patient with severe generalized emphysema, open thoracotomy is contraindicated because of associated morbidity and mortality.

Summary

The occasional patient with generalized emphysema in whom a large unilocular bulla compresses adjacent lung tissue and who is not a candidate for open thoracotomy can be benefited by external drainage of the bulla.

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